

The

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# GEOGRAPHICAL

## MAGAZINE



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# The Work of the Forestry Commission

by PETER COLLINS

WHEN I was a small boy, I lived on the edge of a group of pine woods in East Dorset. Mostly they were young woods, forty years old or less, but one or two blocks were taller, older stands of Scots pine mixed with Pinaster, or cluster pine, whose huge cones we loved for the schoolroom fire.

During World War I, these older stands were felled; a sawmill was set up, by Canadians we were told, on a patch of rough open ground where gypsies used to camp. When it was dismantled after the war, we missed the sound of circular saws and I lost my favourite holiday playground. Between the wars, the younger pine woods grew up and a rough mixture of self-sown pine and birch colonized the derelict ground where the fellings had taken place. World War II saw the felling of the younger woods, and the creation of more derelict land with heather and pine and birch scrub.

All over Britain, woodland was lost in this way during the two world wars, and much of it has not been replanted. But on the open heath country near my old home something better has been done. For a couple of miles off, on what was only rough grazing for a few stray cattle and donkeys, is now Purbeck Forest. Hundreds of acres of young pine cover what was unproductive heathland, in a real forest deliberately created, as part of the effort to make good the losses of two world wars. This is the work of Britain's national forest authority, the Forestry Commission.

In contrast to most European countries, and even to some of the Dominions, Britain had no national forest policy, let alone an authority to implement it, until after World War I. It was in fact the loss during that war of most of the nation's timber resources—already far less than those of almost every continental European country—which led in 1919 to the setting up of the Forestry Commission. From the first, it had a dual function: the establishment of a national reserve of state-owned forests, and the provision of encouragement, advice and assistance to private forestry.

Although the economic instability of the inter-war years was reflected in repeated cuts in the Commission's budget, by 1939 a national forest estate of nearly half a million acres had been built up; 360,000 acres of this had been planted by the Commission, almost entirely on derelict land, moorland or hill country. Even so, over 90 per cent of Britain's standing timber remained in private hands, and it was from this that the demands of World War II had largely to be met; and during those six critical years two thirds of the country's timber requirements came from her own woodlands. The new state forests were in general too young to contribute, but when hostilities ceased the depletion of the nation's timber resources laid an even heavier burden upon the Forestry Commission.

In effect, it has meant an increased emphasis on the first of the Commission's two functions, the establishment of a national forest reserve. The failure to understand—or the refusal to face—the implications of this, is responsible for much continual criticism of the Commission, often on the part of otherwise well-informed and well-meaning people. In particular, the Commission has been attacked for planting conifers, usually of exotic species, and has further been blamed for the inevitable uniformity of appearance of the new forests at certain stages of their growth, which results from such a policy.

The truth is that nine tenths of the demand for timber in this country, in peace or war, is for softwoods, the product of coniferous forest. Add to this the fact that timber and wood products are the second largest item in Britain's import trade, and the logical necessity of concentrating on conifers is apparent. Moreover, even if the Commission wished to plant extensive forests of oak and beech or other hardwoods, as some people think it should, it could not do this on the land available. For, never having exercised compulsory purchasing powers, it has been forced to acquire and afforest land largely useless for any other purpose: sandy heaths, peaty moorland or the roughest of upland





(Left) Pine seedlings in a Forestry Commission nursery, clearly visible six weeks after the planting of the seeds.  
(Centre) Seed beds being sprayed with weed killer by means of a spray boom.  
(Bottom) Two-year-old spruce seedlings

(Above) C.O.I., Crown copyright

(Below) A Shell photograph



By courtesy of the Forestry Commission





pasture, on which only conifers—and those of the hardiest—can be relied upon to produce worthwhile timber.

This limited choice of land has naturally brought the Commission into conflict with those whose principal concern is the preservation of local amenities, and who see in the planting of the bare hillside or open moorland only the loss of some favourite view. People who have visited such regions as the Border Forest Park, along the Scottish border, the biggest concentration of state forests in England, may see for themselves how the new forests, especially when they have been planted at intervals over a long period of years, can enhance the monotonous expanse of hillside and heather; if they result in the loss of one view, such forests will provide in the end another type of scenery just as attractive to many people.

By September 1960, forty-one years after its creation, the Forestry Commission held nearly 2,500,000 acres of land, more than half of which was actually under forest. How great has been the acceleration of the Commission's work can be judged from the fact that, of the forest area, 772,000 acres have been planted since the end of the war. At present, some 60,000 acres are planted up each year, and of this about 5 per

cent is devoted to new hardwood plantations, mostly oak and beech, which are established wherever there is reasonable certainty that a good crop can be grown.

With the exceptions of London and Middlesex, every county of the United Kingdom has its share of the national forests, which number about 500; but the greatest concentrations are in Wales, in the Border country and in the south-west of Scotland and the Highlands. The New Forest in Hampshire helps redress the balance in the south, as does the great expanse of Thetford Chase in East Anglia. In the West Country, the ancient Forest of Dean between Wye and Severn contains a large part of the Commission's most valuable oak woods. Northern Ireland has its own forest authority.

The Commission's central headquarters are in London, where are also the offices of the Director of Forestry for England. Scotland and Wales have their own national headquarters in Edinburgh and Aberystwyth respectively. Each country has a National Forestry Committee concerned mainly with matters of policy. They are subdivided into a number of Conservancies, each comprising eight or so counties; the New Forest and Forest of Dean, however, are

**Cutting new drains for a spruce plantation in Kielder Forest, part of the Border Forest Park**

*Thomas A. Wilkie*







*Thomas A. Wilkie*

*(Above)* Before planting, most of the terrain of Kielder Forest was like this grazing ground.  
*(Below)* Thetford Chase in Norfolk, one of the first of the Commission's forests to be formed.  
*(Opposite)* Coed y Brenin Forest, Merioneth, with hardwood in the valley and pines on the hills

*By courtesy of the Forestry Commission*









Forestry students at Park End School at Lydney, in the Forest of Dean, learning how to sharpen and oil cross-cut saws. Special benches, invented in Sweden, hold them at exactly the right angle

Keystone





separately administered. Again, matters of local interest are watched over by a Regional Advisory Committee in each conservancy; it is at this level that much of the most fruitful liaison with private forestry takes place.

In its encouragement of, and cooperation with, private forestry, the Commission functions in two main ways. The first of these, the provision of free technical advice, amounts in effect to a sort of extension service, and forms an essential part of the day-to-day routine of forest officers all over the country. But it is the second aspect of this cooperation which is perhaps the more important. This is the assistance given in evolving plans for the management of private woodlands, and also, often in connection with such plans, the provision of financial assistance.

Such collaboration was crystallized after the war with the introduction of the 'Dedication' and 'Approved Woodlands' schemes. 'Dedication' involves the signing of a legal covenant on the part of the owner of an estate, whereby he dedicates his woodlands to timber production for at least twenty years in accordance with a working plan agreed by the Commission. He is then eligible for grants towards planting and management. 'Approved' woodlands are those for which a working plan has also been agreed by the owner, who has not however legally bound himself to follow it. Owners of 'approved' woodlands qualify only for planting grants; these are available too for small woods or farm shelter-belts, provided they are also used for timber production and are properly maintained.

Besides establishing and maintaining its own forests, and having what amounts to a watching brief over private forestry, the Commission is responsible for forest research. For this purpose the Commission maintains its own research station at Alice Holt, in the state forest of that name on the Surrey-Hampshire border. Because the Commission has from the first had to establish new forests, often in exposed and remote sites and on difficult and unproductive soils, much of the research at Alice Holt has been pioneer work, covering fields seldom tackled by even the best and most venerable of overseas forestry services.

The establishment of new forests based on exotic species, such as Sitka spruce (*Picea sitchensis*) and lodge-pole pine (*Pinus contorta*), has raised problems peculiar to the conditions under which the Commission works. Such problems, moreover, are as yet only partly identified, for it must be appreciated that none of

the forests planted by the Commission has yet reached anything like maturity. New problems in silviculture and management, and new solutions to them, are continually arising. With the creation of large, often pure stands of exotic species, a watch must continually be kept for pests and diseases. Even our sole native conifer, the Scots pine, has been subject to serious pest attack under forest conditions, as was seen a few years ago when there was a severe outbreak of the pine looper moth, *Bupalus piniarius*, in some forests, and the Commission resorted for the first time to aerial spraying of two of its forests.

Typical of the sort of problems to be tackled are two to which attention is being paid at the present time. One is an investigation of butt rot caused by the fungus *Fomes annosus*, which attacks all species of conifers with varying but always serious effects. The Commission's pathologists have now shown that it can be controlled by rigorous treatment of the stumps of felled conifers with creosote. As this fungus is widespread throughout the forests of many other countries, such successful treatment is of great interest elsewhere, and was demonstrated by the Commission to a group of forest pathologists convened to exchange information on the disease.

Very different is a project, now in hand at Alice Holt, for the study of the effect of wind on the forest, with especial reference to plantations of the type which constitute many of the Commission's holdings in Wales and Scotland. Remarkable as it may seem, little work has been done anywhere on this, and the Commission, faced with the existence of large blocks of forest on very windy sites and relatively unstable soils, is pioneering in this field. Often the effects of research such as this are very different from those the layman might expect. For example, the effects of wind in blowing down trees seem to be most serious when the forest is thirty to forty years old, and has been thinned comparatively recently. Thinning means that the remaining trees have less mutual protection, at least for some years, and are therefore more liable to suffer from wind-blow. A change in thinning policy could affect utilization, since trees thinned earlier, or less thoroughly, will have a different yield, and possibly different uses, from those in mind when the forest was originally established. But the results of this study may be felt over a much wider field. Planting practices on exposed sites, the choice of species for shallow soils, even drainage systems may all be affected.





*Thomas A. Wilkie*

The Forestry Commission makes members of the public welcome, and offers facilities such as *(above)* the recently opened and very popular Lewisburn camping site near Kielder village, and *(below)* the official picnic ground by a lake at Bod Petryal in Clocaenog Forest, North Wales

*By courtesy of the Forestry Commission*





While this type of essentially practical field research is carried out by the Commission, more fundamental work is done, with official sponsorship, at the universities and at other specialized research institutions. Publication of the results of research may be considered as part of the educational function of the Commission, which likewise extends over a very wide field. In the academic sense, it includes the training of foresters—the future n.c.o.s, as it were, of the forest service—which is based on four schools, two in Scotland and one each in England and Wales. (Scotland likewise provides, at Aberdeen and Edinburgh, two of the four university courses in Forestry, the others being at Oxford and Bangor.) The course for foresters, which is free to selected men, lasts two years. Shorter training and refresher courses, for woodmen, woodland owners and the Commission's professional staff, are organized from time to time, many of them being held at the Commission's residential centre, Northerwood House, in the New Forest.

The Commission's educational activities, how-

ever, cover a very much wider field than this. Besides technical publications, it puts out a number of leaflets for the general public, such for example as one on School Forests, and the excellent series of guides to the National Forest Parks and the major individual forests. There is an annual report, which covers the previous forest year (ending in September), and a separate report on research, covering the period to the previous March. But perhaps the most effective piece of public relations work that the Forestry Commission can carry out is through the free access which the public normally has to its forests. The National Forest Parks all have official camping sites, with facilities of one sort or another and an official warden in charge of the site. Camping is also permitted in the New Forest, and there are Youth Hostels in most of the Parks. These areas, all too little known to the majority of the British public, are situated in some of the most beautiful scenery in the country; their very nature makes them ideal for the student of natural history, and within their boundaries some of the rarest and most

**Maypole dancing at Kielder village. Kielder, built by the Forestry Commission in the heart of the Forest, has developed a remarkable community spirit in the ten years of its existence**

*Thomas A. Wilkie*





exciting of our fauna and flora can be found. The appreciation of these unique areas not only benefits the visitor, but also helps to provide better understanding of the purpose and the problems of the Forestry Commission itself. An example of this is the increased cooperation of the public in avoiding and helping to control forest fires, which at certain times of the year are a particularly serious threat to young coniferous forests. In 1960 no less than 1596 acres of state forests were destroyed at a loss of £128,000. One of the largest fires was caused by a cigarette thrown from a passing lorry or car.

One other aspect of the Commission's activities which must be mentioned is the creation of forest villages. Because of the remoteness of many of its forests, accommodation for forest workers was almost completely lacking when the Commission took over many sites. The decision to build its own villages, rather than let them spring up haphazardly, was a bold one; there is little precedent in modern times, at least in Britain, for the establishment of a complete village, with churches, schools, shops and recreational facilities, in a remote area.

When I first visited Kielder Forest, in the north-west of Northumberland, in 1949, the village of Kielder was only partly built, and I looked forward to my second visit, ten years later. In 1959, I found a complete community, the real centre of the forest. Certainly, the cottages still looked grey and new and rather bare: for one reason or another, the forest families had not taken much to gardening, and early in the year the grim northern winter was still in evidence. But the families I spoke to liked their houses, although nearly all, of course, would have preferred something slightly different in one way or another. But from talking to them it was evident that one problem does remain to be solved: that of remoteness from the amenities of life which most people expect today. At Kielder this is hardly the Commission's fault. When I went there in 1949, I could take a train overnight from London and arrive in the forest for breakfast the following day. But now, despite the Commission's objections, the Transport Commission has closed the North Tyne branch line which ran right up the heart of the forest, and communication with the nearest small town, with its cinema and shopping facilities, is even more difficult than it used to be.

Moreover, the diversification of livelihood

which it was hoped the villages might inspire has also not yet taken place. Criticisms of the planning of individual houses derive perhaps from the fact that the houses were not designed by people with long experience of rough living in remote, bitter country. But like so much of the Commission's work, this has been pioneering, and we can be sure that the lessons of these villages will be learned when others are built.

The Forestry Commission, unlike perhaps any other forest authority in the world, has to rely on newly created forests for its existence. Forestry is a long-term affair, and no-one expects the Commission to pay its way yet, although that day will eventually come. But already its income, from thinnings, rents and other sources, stands at over £3,000,000 a year, comparing favourably with a grant-in-aid (for 1960) of £10,702,000. As the new forests grow up, income will rise, and eventually big supplies of timber will be available for housing and other purposes, in addition to the pitprops and pulpwood which at present make up most of the sales. Eventually, one third of the country's timber may come from home sources, of which the Commission will almost certainly provide the greater part.

But while this may seem a long way off, the achievement of the Forestry Commission so far is much too little appreciated. Over the forty-two years of its existence, an estate has been built up that is currently valued (at a very conservative estimate) at over £160,000,000. This compares with under £120,000,000 which the Commission cost the country in grants to the end of last year. Also to be added on the credit side is the creation of a corps of forestry workers, at every level, such as we have never had before: the number of the Commission's employees on September 30, 1960, was 14,669, of whom 2637 were non-industrial staff, such as forest officers and clerks. Other gains are the provision of new and unique recreational areas, freely accessible to all; the preservation of these and many other areas from exploitation of any sort; and the establishment in these areas of new and more varied employment for many thousands of people.

The Commission was set up to establish a national forest reserve where these had been depleted by the demands of a world war. It contributed to the nation's efforts during a second such war; and no-one who cares to look at the forests of Britain with an unbiased eye can deny that it has already gone a long way towards the achievement of its original purpose.



# The Battlefield of Bussaco

by GENERAL SIR JAMES  
MARSHALL-CORNWALL,  
K.C.B., etc.

LAST September, the 150th anniversary of a victory famous in the annals of the British Army, I visited the Serra do Bussaco. This battle has always interested me particularly as it is one of the most striking examples that I know of the influence of geography, both on the tactics of a battle and on the strategic movements leading up to it.

In the summer of 1810 the Peninsular War had already been in progress for two years. Under Napoleon's orders General Junot had invaded Portugal and occupied Lisbon late in 1807; at the request of the Portuguese Government, a British Expeditionary Force under Sir Arthur Wellesley had landed at the mouth of the Mondego River in August 1808. After defeating Junot's two corps at the battles of Roliça and Vimeiro, Wellesley liberated Lisbon, which thus became available as the main base for the British Army throughout the Peninsular War. In March 1809 Napoleon sent Marshal Soult from Galicia to invade Portugal from the north. Soult advanced southward and captured Oporto, but Wellesley, after a forced march, on May 12 made a masterly crossing of the Douro just above the town and drove Soult back into Galicia with the loss of all his artillery and train. Wellesley then advanced into Spain and in July defeated Marshal Victor at Talavera, after which victory he was created Viscount Wellington.

The following year Napoleon made a third attempt to drive the British out of Portugal. One of his most trusted Marshals, Masséna, Prince of Essling, was ordered to march on Lisbon from Salamanca via Ciudad Rodrigo with the 'Army of Portugal', while Soult with the 'Army of Andalusia' was to support him from Badajoz by advancing on Lisbon across the more open country south of the Tagus. The 'Army of Portugal' was 67,000 strong, consisting of Reynier's II Corps, Ney's VI Corps, Junot's VIII Corps and Montbrun's Cavalry Division. The II and VI Corps were veterans who had fought at Fried-



Michael Teague

**The Bussaco Obelisk, commemorating the battle, tops the ridge. Lightning destroyed the original in 1876**

land, Jena and Austerlitz, but the VIII Corps were mediocre troops, largely composed of youthful levies. The Cavalry Division was hardly necessary, as the terrain of northern Portugal is quite unsuited to shock action by mounted troops.

To meet this formidable invasion Wellington could only muster an Anglo-Portuguese Army of 51,000, of whom 27,000 were British and 24,000 were comparatively untried Portuguese.

Prior to Sir Arthur Wellesley's passage of the Douro in 1809, the British Army in the Peninsula was organized only in infantry brigades. In June of that year Wellesley had reorganized it into four Anglo-Portuguese divisions, to which were added during 1810 the Light Division, under that brilliant but sometimes impetuous commander,



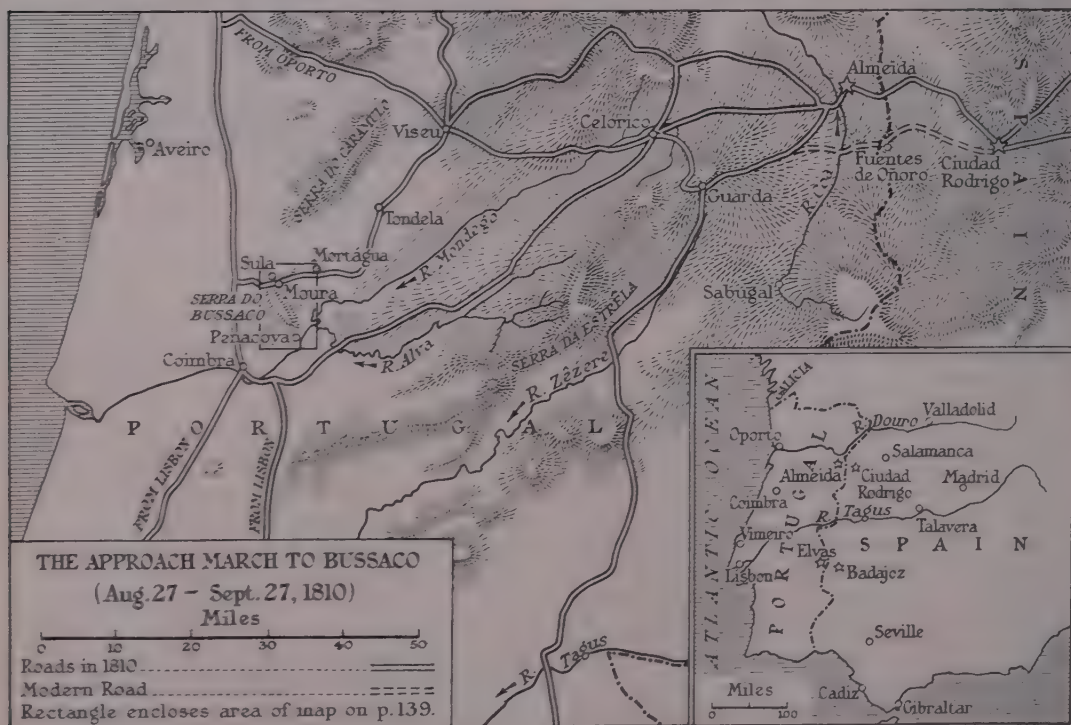
Robert Craufurd, and the 5th Division, under the less spectacular James Leith. Of the other divisional commanders, Rowland Hill (2nd Division) and Thomas Picton (3rd Division) were outstanding soldiers and enjoyed Wellington's special confidence. The Portuguese Army had been entirely reorganized under British brigade and regimental commanders, one Portuguese brigade being incorporated in each of the five British infantry divisions. Craufurd's Light Division had a Portuguese *Caçador* (Rifle) Battalion in each of its two brigades. The French divisions in 1810 averaged over 7000 bayonets apiece, the British divisions being somewhat under that figure.

But, if the Anglo-Portuguese Army was inferior in numbers to its opponents, it had a priceless ally in the tangled topography of northern Portugal. The valleys of the Douro and Tagus, which run down from the Spanish plateau to the Portuguese coast, afford no easy approach to an invader from the east. In fact, where those two rivers cross the frontier, they have carved such precipitous and rocky gorges that no highway can follow their banks. In the 19th century there were only two roads across Portugal's eastern frontier, one via Ciudad Rodrigo and

(*Opposite*) The frontier fortress of Almeida, showing (top to bottom) the south-west gate; a bastion with outwork and glacis; and the north-west bastion, its walls cracked by the explosion of the powder-magazine

Almeida, the other via Badajoz and Elvas. These four frontier fortresses, therefore, two Spanish and two Portuguese, played a leading role in the strategy of the Peninsular War. Wellington, with a force much inferior to the French armies threatening him, had to cover a front of 140 miles, from Almeida to Elvas, in order to protect his base at Lisbon.

The small, isolated fortress of Almeida, which barred Masséna's advance, dominates in every direction a wide, open plateau, scattered with granite boulders. The modern map conveys no idea of the strategic significance of Almeida up to a century ago, for the present highroad and railway from Spain cross the Portuguese frontier ten miles further south at Fuentes de Oñoro, completely by-passing the old frontier fortress. Almeida is now an insignificant village, difficult of access and shrunk within its imposing bastions of granite ashlar. At the time of the Peninsular War, however, the only practicable road across the frontier for eighty miles to north or south passed through the gates of the fortress. A mile







*All three photographs by me. Author.*





and a half west of Almeida the flat plateau is intersected by the deep trench of the River Coa, which runs northward to join the Douro. As one advances further west the country becomes more tangled and broken, until one reaches the prominent outcrop of Guarda, where one is confronted by the steep massif of the Serra da Estrêla, 6500 feet in height, and the twisting, rocky gorge of the River Mondego, which rises on the flank of the mountain.

To begin with, Masséna's advance progressed successfully. On July 10, after a fortnight's siege, Ney's Corps captured Ciudad Rodrigo, gallantly defended by a weak Spanish garrison, and invested Almeida on August 15, after pushing back Craufurd's Light Division, which had been holding an outpost line on the Coa. Almeida was held by a Portuguese garrison under a British brigadier. On August 26 a disaster occurred: a leaking keg of gunpowder, which was being carried up to a gun emplacement, laid a trail of powder right back to the main magazine. This powder-trail was ignited by a French shell,

causing the magazine to explode with great destruction. The following day the garrison was forced to capitulate. I was interested to note that the cracks in the masonry of the fortress caused by the explosion are still visible.

The premature fall of Almeida was a serious blow to Wellington, who had hoped that it would delay Masséna for two months, until the autumn rains came to hinder his advance. The six Anglo-Portuguese divisions were strung out on a fairly wide front, from north of the Mondego to south of the Tagus, as Wellington could not be sure where Masséna's superior force would strike. Should Masséna advance north of the Mondego, Wellington had decided to stand and meet him on the Bussaco ridge, twelve miles north-north-east of Coimbra.

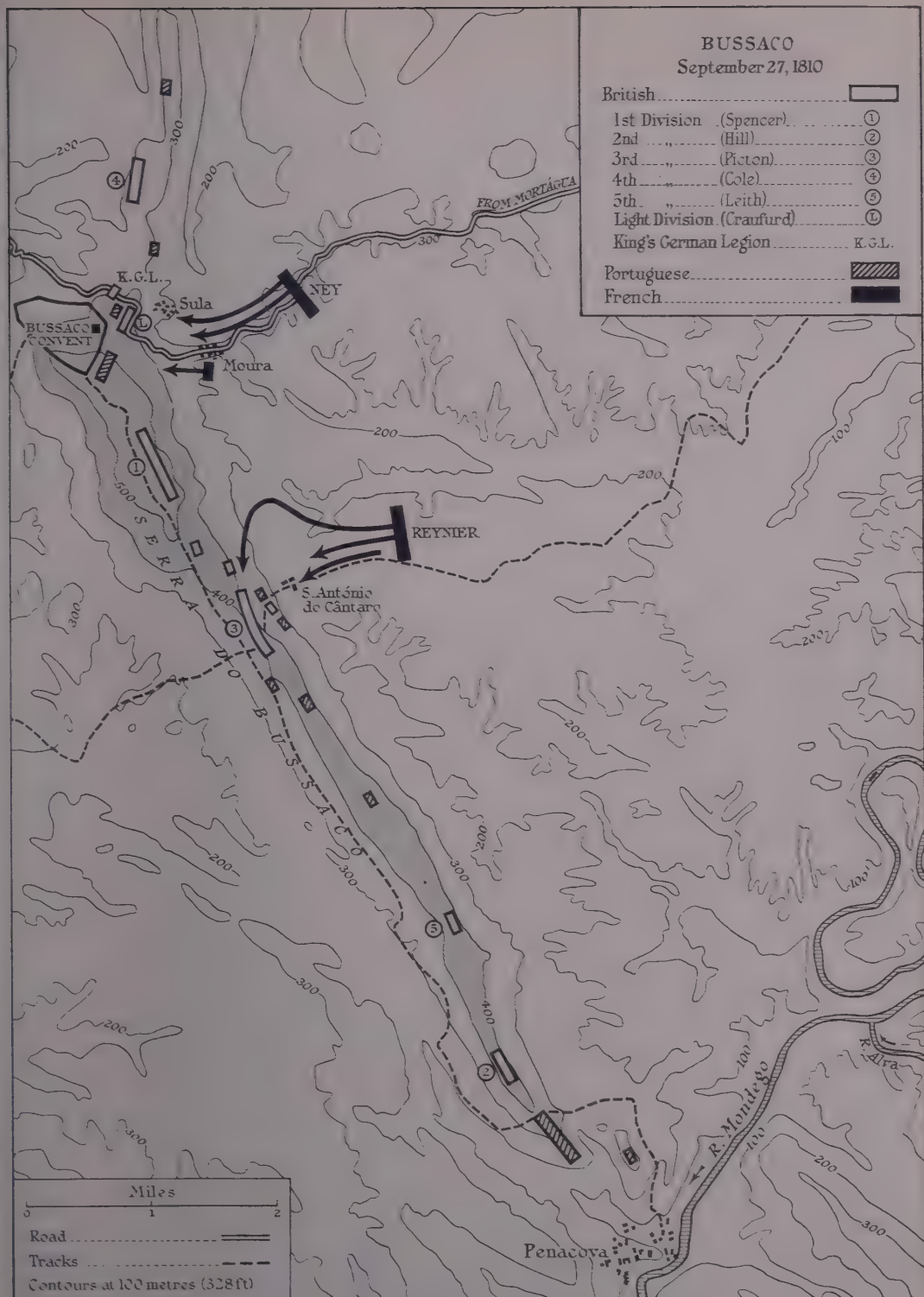
Sir Charles Oman describes the Bussaco ridge as 'one of the best-marked positions in the whole Iberian Peninsula'. Masséna, in his despatch to Napoleon after the battle, wrote: 'The position is undoubtedly the strongest in all Portugal.' It is a steeply scarped hog's back, nine miles in

**The Serra do Bussaco from Moura where the French columns started their assault. Reynier's Corps attacked the central and highest part of the ridge; Ney's Corps attacked more to the right**

*The author*









length, running from north-west to south-east. Its north flank is covered by the tangled foothills of the Serra do Caramulo, while its south flank drops precipitously into the gorge of the Mondego. Over the northern shoulder of the ridge winds the main road from Viseu via Mortágua and Moura to Coimbra. Its highest point, 1864 feet above the sea, offers a magnificent view in all directions. Just behind the crest-line, where the Coimbra road crosses the ridge, was the small Carmelite Convent (or as we would call it, monastery, since it was occupied by monks) of Bussaco, later incorporated into a royal shooting-lodge, and now a luxury hotel. I was disappointed to find that the whole ridge has in recent years been planted with pine forest, which greatly restricts the view, but 150 years ago, apart from the Convent enclosure which was planted with tall cypresses, the ridge was open heath-land, covered with heather and broom and strewn with large boulders.

Wellington had spent the night in the 17th-century Convent of Bussaco. (Below) His horse was tethered to this olive tree in the courtyard. (Opposite) The former Convent, left-centre, is now part of a hotel

The author



After the fall of Almeida, Masséna pushed on westwards in the direction of Celorico, which he reached on September 15. Here the highway forks, the left branch following the northern contours of the lofty Serra da Estrêla south of the Mondego gorge, the right one taking a more circuitous line of country further north, by way of Viseu and the Bussaco Convent to Coimbra. As the country turned out to be far more broken and rugged than Masséna had anticipated, and his artillery and train were being seriously delayed by the steep and winding country tracks, he chose the northern road via Viseu. Here he halted for six days (September 18 to 24), a delay for which he has been justly criticized by all military writers. In his despatch to Napoleon dated October 4 Masséna explains this delay as follows: 'We had to stop there for five days in order to give the artillery-park and the train time to arrive and reorganize.' Baron de Marbot, Masséna's aide-de-camp, gives a rather different

reason, which is perhaps worth recording. Thinking that his march on Lisbon would be in the nature of a picnic, Masséna had taken with him a young lady, dressed up as a captain of dragoons, whose identity is discreetly concealed by Marbot under the name of 'Madame X'. Although fighting was now imminent, Madame X could not be left behind in that wild frontier region, where the Portuguese guerrillas closed in on the tail of every French column and cut off the stragglers. Marbot explains Masséna's protracted halt at Viseu as follows: 'The fatigues experienced by Madame X contributed greatly towards delaying Masséna and holding him up there, for with the country in a state of insurrection it was impossible to leave her behind without exposing her to the risk of capture.'

Masséna's six-day halt at Viseu was a godsend to Wellington, who now knew that the French Army was committed to the northern road which led across the Serra do Bussaco. He at once ordered Hill's 2nd Division, which had been south of the Tagus, to march north, and pulled in the troops









The *Penedo de Craufurd* (Craufurd's Rock), on the forward crest of the Serra do Bussaco, formed Craufurd's command post during the battle. From it he had a clear view of the steep slope below, up which Ney's massed columns breasted the hillside. He had hidden his Light Division behind the crest, out of sight of the enemy field-guns. As the French reached the crest, Craufurd gave the waiting lines of British and Portuguese riflemen the order to charge with the bayonet, and the attackers were driven down the hill with fearful loss of life. (Left) Looking across to Craufurd's position from Masséna's command post in the windmill near Moura. It was from here that Ney's two divisions assaulted the Convent sector held by the Light Division, after Reynier's Corps had attacked the central sector





Looking eastwards from Craufurd's Rock a magnificent view extends over the broken foot-hills through which Masséna's three army corps had to advance. The modern road from Mortágua to Coimbra, on the right, hugs the contours; the old road followed the lower level of the valley, climbing the ridge more steeply. The village on the right is Moura. On the left is Sula, taken by Ney's troops before they were driven off downhill by Craufurd's counter-attack





The village of Penacova, perched on the southern extremity of the Serra do Bussaco, where the ridge drops abruptly into the Mondego valley. This formed the Anglo-Portuguese right flank, held by Hill's 2nd Division and a Portuguese brigade, which was never attacked by the French. In the foreground is the Rio Mondego, about seventy yards wide and fordable in places during September. Until Wellington was certain that Masséna's attack was coming north of the river he kept the 2nd and 5th Divisions to the south of it



entrenched along the Rio Alva, south of the Mondego. By the night of September 26 he had concentrated 50,000 men and sixty guns on the Bussaco position. But only a screen of outposts was visible on the forward slope, the bulk of the troops being held concealed behind the crest. The main reserve, consisting of Cole's 4th Division with the King's German Legion and two Portuguese brigades, was stationed to the north of the main Coimbra road, hidden behind the crest. A good cart-track ran along the rear of the position, behind the crest, affording easy lateral communication, and this was rapidly improved by Wellington's sappers with the help of local labour.

Meanwhile the advanced guard of Reynier's II Corps had been pushing on through Tondela

and Mortágua until it reached the little village of Moura, where the Coimbra road starts to climb the steep Bussaco ridge. Here on the afternoon of September 25 the skirmishers encountered the British and Portuguese outposts and deployed to the south of the road, while Ney's VI Corps came up on Reynier's right astride the road. Junot's VIII Corps and Montbrun's Cavalry Division were eight miles behind at Mortágua with Masséna's headquarters.

As soon as the morning mist lifted at 8 a.m. on September 26, Reynier reported to Masséna, through Ney, that his skirmishers were in touch with Anglo-Portuguese outposts on the lower slopes of the Serra and that five Portuguese battalions had withdrawn to the crest; six guns were visible on his front. He added: 'It looks to

**The Rio Mondego just above Penacova. Further upstream it flows through a precipitous gorge**

*Michael Teague*





me like a rearguard, but the position is strong and will require an organized attack.' At 10.30 a.m. Ney forwarded this report to Masséna, together with his own, which said that the enemy appeared to be withdrawing north-west towards Oporto, but that a strong rearguard was holding the Bussaco Convent with twelve guns in position. He sent off an A.D.C. with these reports to Masséna at Mortágua, urging the Army Commander to come up at once and make a decision. In a message to Reynier at the same time Ney added significantly: 'If I were in command I would attack without a moment's hesitation.'

But now again the nefarious influence of Madame X threw its shadow on the field of battle. Ney's A.D.C. rode back to Mortágua in an hour, which was good going, but Masséna kept him waiting two hours before seeing him, and he was sent back with the order that no attack was to take place before Masséna himself arrived. Marbot explains Masséna's delay at Mortágua as follows: 'Precious time was lost while he secured lodging for Madame X, and he and his staff did not leave for the outposts till two in the afternoon.' Masséna, who was an indifferent horseman, did not reach Moura until late that afternoon, and then issued orders for Reynier to attack the position frontally at 7 a.m. the following morning; as soon as Reynier's Corps should reach the crest, Ney's Corps was to attack the Convent sector astride the main road. Incredible as it may seem, Masséna then returned to Mortágua to spend the night there. In contrast, Wellington remained on the battlefield, in one of the monk's cells of the Bussaco Convent; in the garden I was shown the olive tree to which his horse was tethered.

At early dawn on the 27th, Reynier launched his attack on a two-division front, with fifteen battalions in column, up the steep slope south-west of the village of S. António, where a rough track led across a col in the ridge. This sector was held by Picton's 3rd Division, a weak division numbering under 5000 men. The French attack reached the crest, but was driven back by an immediate counter-attack by the 88th Regiment (The Connaught Rangers). Reynier, thinking that this was the extreme British right flank, continued to push his columns up the stiff slope, and Foy's brigade succeeded in gaining the crest. The previous day, however, Leith's 5th Division and Hill's 2nd Division had crossed the Mondego and were now holding the remainder of the ridge to its extreme right at Penacova. Wellington had ordered Leith, if not himself attacked, to

close in and help the troops on his left. This Leith now did with great effect; his flank attack, together with Picton's counter-attacks, drove the exhausted and shattered French columns down the hill.

As soon as Ney saw that Reynier's troops had reached the crest of the Serra, he sent forward Loison's and Marchand's divisions on either side of the Moura-Coimbra road, directed on the Bussaco Convent. Here Craufurd was waiting for them with the Light Division. Although numbering less than 4000 men, they held an ideal position, covered by the cross-fire of twenty British and Portuguese guns which enfiladed every turn of the road. Craufurd let Ney's massed columns top the rise, then charged them with the bayonet and hurled them down the slope. The windmill from which Craufurd observed the French advance commands the whole valley below, and as I stood next to it, on the '*Penedo de Craufurd*', it was easy to visualize the discomfiture of the French columns as they arrived exhausted on the crest. Further south along the ridge I found the rocky pinnacle from which Wellington personally controlled Leith's and Picton's deadly counter-attacks.

The French repeated their attacks with great gallantry, but all met with the same fate. On the ground I could realize the reason why. The ridge rises 800 feet above the valley; the average gradient of the slopes up which the French columns struggled was 1 in 3, and the elevation of the crest was such that their field-guns could not afford them adequate supporting fire. In the late afternoon, disheartened by the terrible casualties suffered by his two best corps, Masséna broke off the battle, although he still held in reserve a division of Ney's Corps and the whole of Junot's Corps. As one French military writer says: 'Masséna showed neither boldness nor foresight.' The French had 4500 casualties in the battle, the British and Portuguese only 1252 in all—626 each, so honours and losses were evenly shared between the allies.

Many factors contributed to the victory, including the shadowy presence of Madame X, but we may say that the decisive ones were the geography of northern Portugal and the genius of the leader who so brilliantly turned it to account.

Apart from its attractive and varied landscapes, this rolling country between Coimbra and the Spanish frontier makes a special appeal, to those who, like myself, cherish the records and traditions of the British Army. One can still see the site of the bridge over the Coa, near Almeida,




Wall-tiles depicting the bayonet charge of the Portuguese *Caçadores* (riflemen) who formed part of Craufurd's Light Division. Behind them is the Convent enclosure with its old cypresses

Museum, Coimbra

where Craufurd's Light Division attacked more than four times its number of French, but in doing so drew down Wellington's wrath on their commander's head for losing three hundred men to no purpose. The frontier villages have changed but little, so it seemed to me, since Wellington made his headquarters in them throughout that summer of 1810, when, covered by his cavalry picquets and Craufurd's gallant riflemen, he watched carefully every move made by Masséna. In spite of a certain amount of afforestation and the construction of one railway line and some new roads and bridges, the countryside has scarcely altered. A uranium mine has sprung up at Canas de Senhorim, but it is well tucked away in the middle of a pine forest. The forests consist

mainly of pine and eucalyptus, with a few chestnuts and cork-oaks; vineyards and olive-groves clothe the hillsides, and the valleys are green with maize and orchards. Squat little white windmills crown the hill-tops and enormous water-wheels, introduced perhaps by the Moors, scoop up water from the rivers for irrigation. The roads are excellent, and the comfortable Urgeiriça Hotel at Canas de Senhorim, halfway between Celorico and Bussaco, makes a convenient centre for exploring the topography of Masséna's approach march. As I was able to discover, the British traveller is always assured of a warm welcome in this friendly country, with which our own has been allied for so many centuries.





# Australia's Snowy Scheme

by

SIR

WILLIAM HUDSON,

K.B.E.

COMMISSIONER, SNOWY  
MOUNTAINS AUTHORITY

*(Left)* Work on the Snowy Mountains Scheme goes on whatever the weather.  
*(Opposite)* Water outlet tunnels from the turbines of Tumut I power-station

*All photographs by courtesy of the Snowy Mountains Hydro-Electric Authority*

AUSTRALIA lies within the dry belt of the Southern Hemisphere. The northern portion of the continent is too far south to benefit to any extent from the monsoonal downpours of the tropics and the southern portion is too far north to receive the regular rainfalls of the Temperate Zone. Its geographical position, its absence of high mountain ranges and the great distance of its hinterland from the ocean make it the driest continent in the world. Areas on the mainland with a rainfall of over thirty inches a year are confined mostly to the narrow strip running along the east coast and the northern fringe of the continent. The inland has a semi-desert rainfall of only ten inches or less annually. In addition, the yearly rate of evaporation over most of the continent is high. These circumstances highlight the vital importance to Australia of water conservation; in fact, of all the tasks that lie ahead of this progressive and rapidly expanding country, none is of greater national significance than the effective use of its meagre water resources.

In the south-east corner of the continent there is ample water, much of which comes from the melting snows of the Snowy Mountains, which are a part of the Great Dividing Range. The run-off from the eastern or coastal side of these mountains finds its way to the Snowy River which, after leaving the highlands, flows through the well-watered coastal strip to waste itself into the nearby Tasman Sea. The western side of the mountains is drained by the Murray and Murrumbidgee Rivers, which meander for hundreds of miles across the dry but otherwise fertile plains of the inland in their long journey to the coast of South Australia. Irrigation on these plains is already making industry prosper, but further large-scale development is dependent upon the supply of more water into the Murray and Murrumbidgee Rivers.

In 1949 the Federal Government embarked on Australia's most ambitious water conservation project, the Snowy Mountains Scheme. Although this Scheme is one of the world's largest civil engineering undertakings, and certainly one of the most complex, the principle underlying its development of the water resources of the Snowy Mountains is quite simple. This is to collect the waters of the Snowy River where they leave the eastern side of the mountains and turn them inland through long trans-mountain tunnels into the Murray and Murrumbidgee Rivers. By this means, 1000 square miles of the dry western plains can be brought into use for intensive food







production. In passing through the tunnel systems the diverted waters will fall over 2500 feet, generating large quantities of hydro-electric power.

The Snowy Scheme embraces the construction of nine major dams and many smaller ones, about 100 miles of tunnelling, eleven power-stations, and over 80 miles of aqueducts high up in the ranges to catch the mountain streams that otherwise would miss the reservoirs and tunnels. It will provide 2,500,000 kilowatts of peak load power for the Australian Capital Territory (around Canberra) and the States of New South Wales and Victoria; also approximately 2,000,000 acre-feet of water a year for increasing food production in the Murray and Murrumbidgee Valleys. The capital cost of the Scheme will be about £400,000,000.

The task of building the Scheme is in the hands of the Snowy Mountains Authority, a Commonwealth Statutory Body established under the Snowy Mountains Hydro-Electric Power Act, 1949. Investigations, designs and construction

operations commenced immediately after the passing of the Act.

The half-way mark in the construction of the Scheme has now been reached. The first of the two main trans-mountain diversions has been completed. Two power projects are in operation and a third will follow by the end of 1961 or early in 1962. All of the works will be completed by 1975.

The Scheme can best be considered under two geographical groupings as follows:

- (1) The Snowy-Tumut Development, which provides for the diversion through a trans-mountain tunnel of the Eucumbene River, a tributary of the Snowy River, to the Tumut River, a tributary of the Murrumbidgee River; also the diversion of the upper Murrumbidgee River to the Eucumbene River, and the Tooma River in the Murray Catchment to the Tumut River.
- (2) The Snowy-Murray Development, which

*(Left)* The excavations for Tumut II power-station, 850 feet underground, which will have a maximum generating capacity of 280,000 kilowatts when it comes into operation in 1962. *(Below)* Lining one of the trans-mountain tunnels with concrete; like most modern tunnelling processes, this is a very highly mechanized job. The concrete is mixed in the tunnel itself





*The main features of the Snowy Mountains Scheme are shown (below) diagrammatically in section and (opposite) on a contour map. (Letters A to H and W to Z refer to the map)*

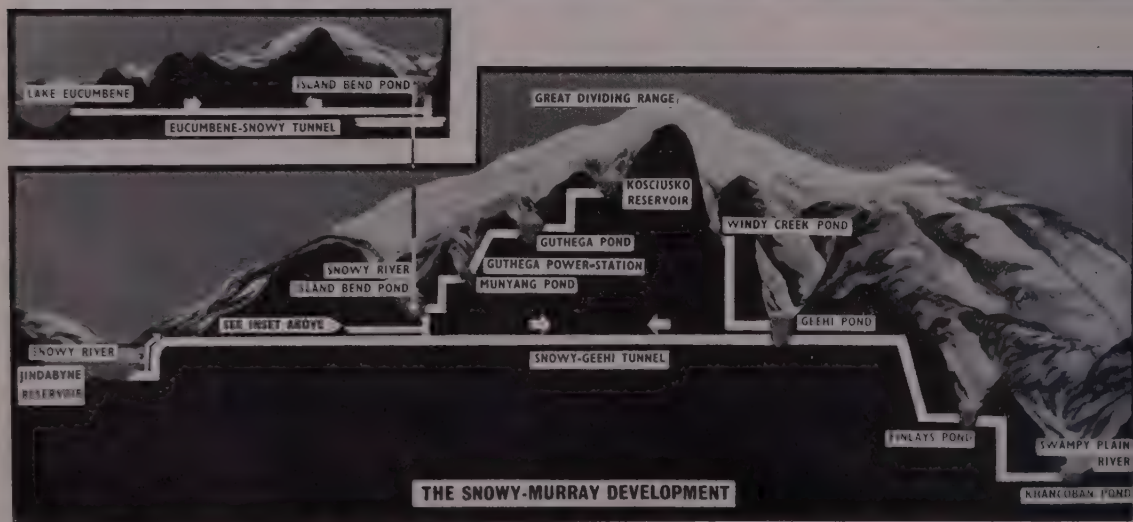
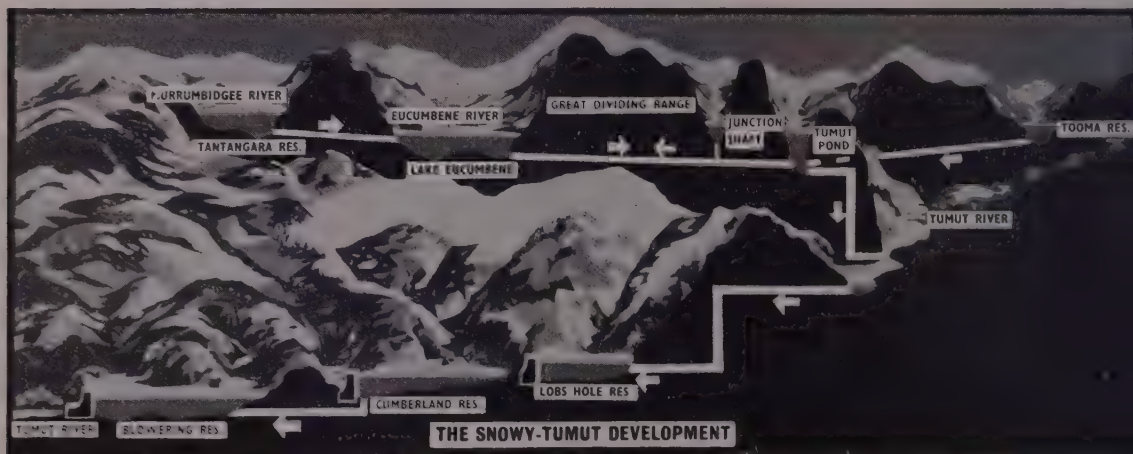
## THE SNOWY-TUMUT DEVELOPMENT

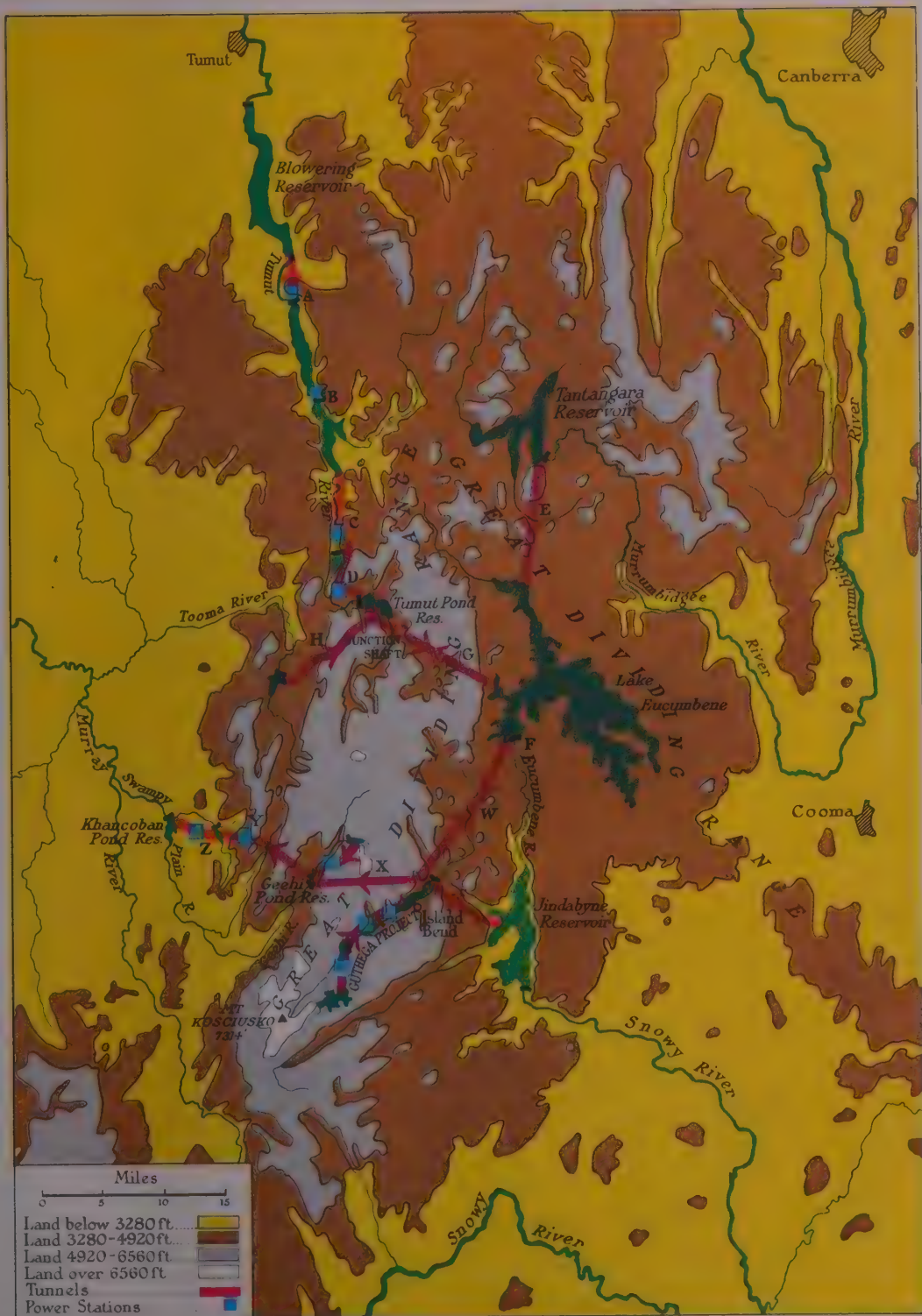
Water from the upper Eucumbene River is held back by **Eucumbene Dam (F)**, forming **Lake Eucumbene**. This lake will also receive the upper Murrumbidgee River through the 10½-mile **Murrumbidgee-Eucumbene Tunnel (E)**. During normal or low flow the combined upper Eucumbene and Murrumbidgee Rivers will flow from Lake Eucumbene through the 14-mile **Eucumbene-Tumut Tunnel (G)** to join the Tumut River in **Tumut Pond Reservoir**. The flow through this tunnel can be reversed and flood water from the Tumut stored in Lake Eucumbene. The upper Tooma River also flows into Tumut Pond, through the **Tooma-Tumut Tunnel (H)**. From Tumut Pond, the waters of the Tumut, Eucumbene, Murrumbidgee

and Tooma Rivers will fall 2700 feet and operate the four **Tumut Power Projects (D, C, B and A)** on their way to irrigate the lower reaches of the Murrumbidgee.

## THE SNOWY-MURRAY DEVELOPMENT

A reservoir on the Snowy River at **Island Bend** will be connected with Lake Eucumbene by the 15-mile two-way **Eucumbene-Snowy Tunnel (W)** and with **Geehi Pond Reservoir** by the 9½-mile **Snowy-Geehi Tunnel (X)**. The upper waters of the Snowy can be directed to storage either in Lake Eucumbene or in Geehi Pond, and water can be drawn back from Lake Eucumbene to Island Bend and on to Geehi Pond. From Geehi, water will fall 2600 feet to the Swampy Plain River (and so into the Murray River) through **Murray I Project (Y)** and **Murray II Project (Z)**, operating two power-stations. Another source of water and power is the **Guthega Project**.









Civil engineering works in remote areas, such as the Snowy Mountains Scheme, present problems apart from those of construction. Surveys in difficult conditions must be made; roads built; and a large labour force housed in the 'middle of nowhere'.  
*(Left)* Members of a survey party on the west side of the Snowy Mountains.  
*(Below)* A camp up in the mountains to house drilling teams and surveyors

*Ektachromes by courtesy of the Snowy Mountains Hydro-Electric Authority*



Constructing the concrete dam for a reservoir which forms part of Tumut II Power Project. Water is taken from it along a three-mile pressure-tunnel to the power-station, then returned to Tumut River







This dam, 283 feet high, holds back Tumut Pond Reservoir, whose capacity is 43,400 acre-feet

Tumut I power-station is 1200 feet underground. It is capable of generating 320,000 kilowatts





(Below) Eucumbene Dam is 381 feet high, one of the largest earth and rockfill dams in the world. It contains Lake Eucumbene, a reservoir which, with a capacity of 3,800,000 acre-feet, provides the main water storage for both the Snowy-Tumut and the Snowy-Murray Developments. (Opposite) Guthega Dam and Pipeline. The Guthega Project has been in operation since 1955









Agriculture in the inland plains of south-east Australia, watered by the Murray and the Murrumbidgee Rivers, depends very largely on irrigation. The Snowy Mountains Scheme will help increase production by diverting more water into these rivers from the Snowy. (Left) Oranges growing at Waikerie; (below) part of the irrigation system of an apricot orchard at Loxton: these two places are on the Murray River

*Kodachromes by courtesy of the South Australian Government Tourist Bureau*



provides for the diversion through a second trans-mountain tunnel system of the Snowy River to the Murray River.

A 15-mile 'two-way flow' tunnel from the Snowy River to Lake Eucumbene, the Scheme's main storage on the Eucumbene River, will connect these two Developments, which are described in detail on page 152.

The Snowy Scheme extends over nearly 3000 square miles of Australia's most rugged and mountainous country. Snow covers the ranges for six or seven months every year. When the Snowy Mountains Authority was established in July 1949, the greater part of this area was inaccessible except to experienced bushmen. No reliable maps were available and little information on the geological structure of the country had been collected.

The first task facing the Authority was to build up an organization of engineers, surveyors, geologists, hydrologists and other professional personnel; and to collect and equip field forces to build camps and roads, erect bridges and carry out other preliminary works necessary to open up the area before beginning the major construction operations. Men were recruited from all over the world; in fact the labour force on the Snowy Scheme is perhaps the most cosmopolitan in the world, representing thirty-two nations. The integration of many thousands of 'New Australians' and their families into the Snowy community, most of whom have since become permanent Australian citizens, has indeed been an interesting and successful experiment.

Trigonometrical and aerial surveys, engineer-

ing and geological investigations, hydrological studies, the design of structures, the construction of roads and other preliminary works were the next immediate step, followed by the placing of contracts for the major works.

As I have already mentioned, the execution of the Scheme has now reached the half-way mark. Up to the present, construction activities have been concentrated on the Snowy-Tumut Development. Lake Eucumbene (formed by the huge Eucumbene Dam), Tantangara Reservoir and the 10½-mile-long Murrumbidgee-Eucumbene Tunnel, Tooma Reservoir and the 9-mile Tooma-Tumut Tunnel, the 14-mile Eucumbene-Tumut Trans-mountain Tunnel, the Guthega Project and the Tumut I Project are already in operation. The construction of the Tumut II Project is almost completed. Power for the industries of New South Wales and Victoria and water for food production on the rich plains of the Murrumbidgee are now being supplied in increasing quantities.

Now that so much on this side has been completed, the construction forces are being transferred to the Snowy-Murray Development to tackle the 15-mile Eucumbene-Snowy Tunnel, and the second trans-mountain tunnel system (Snowy-Geehi) and the large Murray I and Murray II Projects, which together will turn the Snowy River to the Murray River.

A pleasing feature of the work has been the high rate of progress achieved by the teams of Australian and New Australian construction men, working under Norwegian, French, American and Australian contractors. With the exception of one contract which was finished on time,



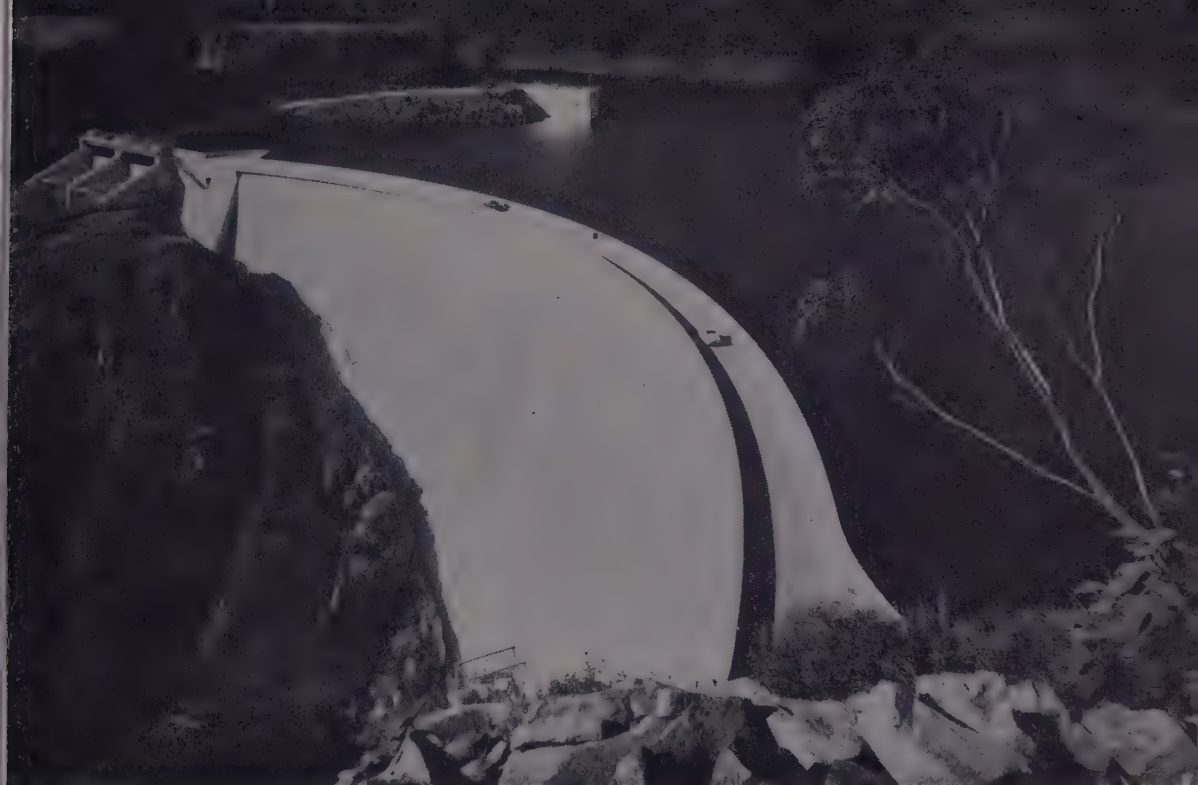
A. J. Thornton





(Above) Grass seed planted by the road to prevent soil erosion is given a protective spraying.  
 (Below) One among many, this road train can carry loads of up to 135 tons. New roads had to be built and the old ones improved before work on the Snowy Scheme itself could get under way





**Tumut Pond Dam.** The reservoir stores water for the Tumut Power Projects

all of the contracts have been completed well ahead of schedule. For instance, the four years' contract period for the 381-foot-high Eucumbene Dam was halved, the Tumut I Project started commercial production seven months ahead of the scheduled date, and the Tumut II Project, now nearly finished, will be producing electricity twelve months ahead of the planned date.

Tunnelling results have also been spectacular. For example, when the Scheme started, the world's record for advancing the face of a large diameter tunnel in hard rock was claimed to be 362 feet in a six-day week. In the Eucumbene-Tumut Tunnel the Kaiser Group of American contractors achieved a tunnelling speed of 482 feet a week; this was followed by the Australian contractors, Thiess Bros, tunnelling at the rate of 520 feet a week, and by the American Utah Group who reached the figure of 592 feet. In all cases the tunnelling crews were exclusively Australian and New Australian, most of whom had never previously worked underground.

Power from the Snowy Scheme will be transmitted to the load centres of New South Wales and Victoria at 330,000 volts, the highest voltage yet used in Australia. The distance in each case is about 250 miles. The first of these lines, connect-

ing the Authority's switching station for the Tumut I and Tumut II Projects in the Snowy-Tumut Development with Sydney and Melbourne, came into operation in 1959.

Except for the section connecting the Snowy-Tumut Development and the Snowy-Murray Development, the 330,000-volt transmission system has been constructed by the Electricity Commissions of New South Wales and Victoria.

Australia is a large country carrying a population of only 10,000,000 people. Its future freedom in this overcrowded world depends on its ability to build up its population quickly to many times this figure. There is no time to lose. In step with this necessary population build-up there must be a commensurate expansion in primary production and secondary industries. During the last few decades, progress in this direction has been phenomenal, but it must continue. The Snowy Scheme, which is a national undertaking conceived to provide huge quantities of water with which to increase food production for a rapidly growing population and for export, and to provide more power for its expanding industries, is typical of the nation's endeavour to ensure prosperity and security for future generations of Australians.



# Kashmir's Capital



All photographs by Mono Mitra, from Camera Press

The beautiful city of Srinagar is the summer capital of Kashmir; the winter capital is Jammu, to the south. Srinagar lies in the Vale of Kashmir, 5227 feet above sea-level, and the great chain of the Himalayas towers up to the east. Across this high valley, and through the middle of Srinagar, flows the River Jhelum, which then cuts its way westward by wild gorges between the encircling foothills and drops down to join the Indus in the plains. The houses, temples and walled gardens of Srinagar press in on the Jhelum, and the traffic of the city is carried as much by boat as by the horse-drawn *tongas*. Seven wooden bridges span the river



A. J. Thornton





Anyone who has visited Srinagar remembers the water and the trees: the river itself and the canals within the city; the smooth expanse of Dal Lake near by; and the water gardens of Nishat Bagh and Shalimar. The visitor voyages by *shikara*, the water-taxi, in canopied indolence, his fingers trailing in coolness; he lodges on one of the many houseboats moored by an island in the lake, and gazes through poplars to the mountains









While the final status of Kashmir remains undecided, the government of the country is carried on from Jammu and Srinagar. The Chief Minister (*left*) appears in person to receive a deputation; and in the palace of the former Maharajah of Kashmir, on the banks of the Jhelum in Srinagar (*below*) the Government Secretariat directs the country's administration



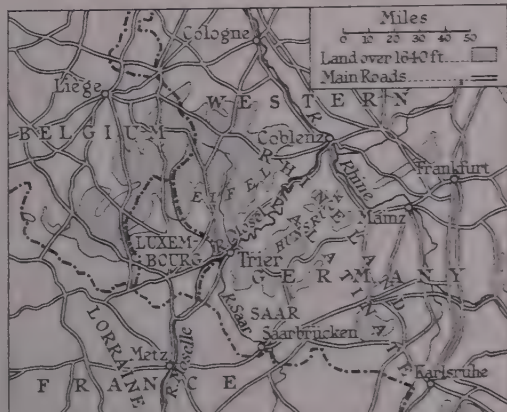
# Trier: Germany's Oldest City

by BRYAN LITTLE



By courtesy of the German Tourist Information Bureau

TRIER was Augusta Treverorum to the Romans, named after the local Belgic tribe, the Treveri. It is not only the oldest but is also among the most attractive of German cities. It was once the seat of Roman Imperial government for most of north-west Europe. From that period of Caesars and haughty senators, and from later ages, it has much to show both of interest and beauty. Just inside Germany, close both to Luxembourg and France, it is a city which no visitor to that part of the Continent should miss. Nor is it a city living solely on past glories. It is the administrative centre of a *Bezirk* (about equivalent to an English county) within the Federal German *Land* of the Rhineland-Palatinate, while one of



A. J. Thornton





(Above and below) By courtesy of the Verkehrsamt, Trier  
**(Above)** The Roman amphitheatre, though robbed of much of its masonry, is still an impressive sight.  
**(Left)** One of the many Roman mosaics found in Trier. **(Below)** The outer façade of the Porta Nigra is the finest of all Trier's Roman remains. Close by **(opposite)** is the charming Simeonstift monastery



**(Left)** By courtesy of the Rheinisches Landesmuseum, Trier





its best post-war buildings, the Kreishaus, houses the administration for the smaller subdivision of a *Kreis*. Trier's population of about 90,000 makes it one of the largest towns in the extreme west of Germany. Though it is some sixty miles, in a straight line, from the Rhine, there is still a Rhineland feeling, somewhat cosmopolitan, about the people, and in their pronunciation of German they are Rhinelanders too.

The best approach to Trier is by road from the west. As you traverse the beautiful hill and woodland country of the Eifel the city remains out of sight. But from the ridge high above the broad channel of the Mosel, which falls in precipices to the narrow belt of land containing Trier's suburb of Pallien, you suddenly see the whole of the city, which the Romans wisely placed on

one of the few reasonably wide stretches of even ground in this winding valley of steep vineyards and ancient towns. The Mosel, now being canalized and soon to become navigable for barges all the way from the Rhine at Coblenz, was for long Trier's commercial highway and the scene of its citizens' aquatic pleasures. Once the Mosel becomes navigable Trier will see the motor barges toiling from as far off as Rotterdam or the Ruhr. The coal and oil so handled (fortunately at points away from the attractive, tree-lined promenades along the river bank) are bound to bring relief to the heavy freight traffic whose trains now frequently roar past Pallien towards the Saar, Luxembourg or Lorraine. Though Trier's industry is inconspicuous, and compared to the Ruhr and Rhineland on a small scale, it

The cathedral, in which much of the original Roman basilica remains. Its apses and towers are typical of German Romanesque. The Liebfrauenkirche on its right is in the French Gothic style

Mansel, C. Newton



has considerable range and variety. Tobacco and textiles are both of some importance, while radio, optical and electrical goods are all made there. Its citizens hope that when the Mosel becomes fully navigable, and when this coming development makes their city a modern river port, their industrial prospects will improve. It is a good omen that a large new light engineering factory is now being built, with the help of American capital, on the northern outskirts. Local industries may soon provide work for those who now migrate to such areas as the Ruhr.

The Mosel, and the wine-green slopes vividly reflected in its steady water, is much as it was when in the 4th century, with Trier's European importance at its peak, it inspired the Gallo-Roman poet and politician Ausonius to write the *Mosella*, his long descriptive poem. The river and its fishing facilities are bound to change greatly as new locks are built to serve the dense barge-traffic of a booming modern Europe. But from Trier's century of imperial glory the relics are numerous and will remain inviolate.

One's very entrance to Trier has a Roman keynote, for one of its bridges, the Römerbrücke, rests on great piers of Roman masonry. The riverside, as also in the Middle Ages whence a picturesque old crane has survived, was Trier's 'utilitarian' area. The city's origin lies at least as far back as the year 15 B.C. It soon became a base for supplying Rome's armies in the frontier districts of Germany. It was commercially important: huge casks of Mosel wine were shipped down river, neatly stowed athwart the barges whose pilots squatted in the bows to give warning of the numerous shallows and rocks in the limpid river. The granaries, as one can tell from their excavated sites, were planned on the same lines as those built in the British military stations along Hadrian's Wall. But Trier's time of distinction, the 'imperial' period, was over three centuries later than its foundation by Augustus.

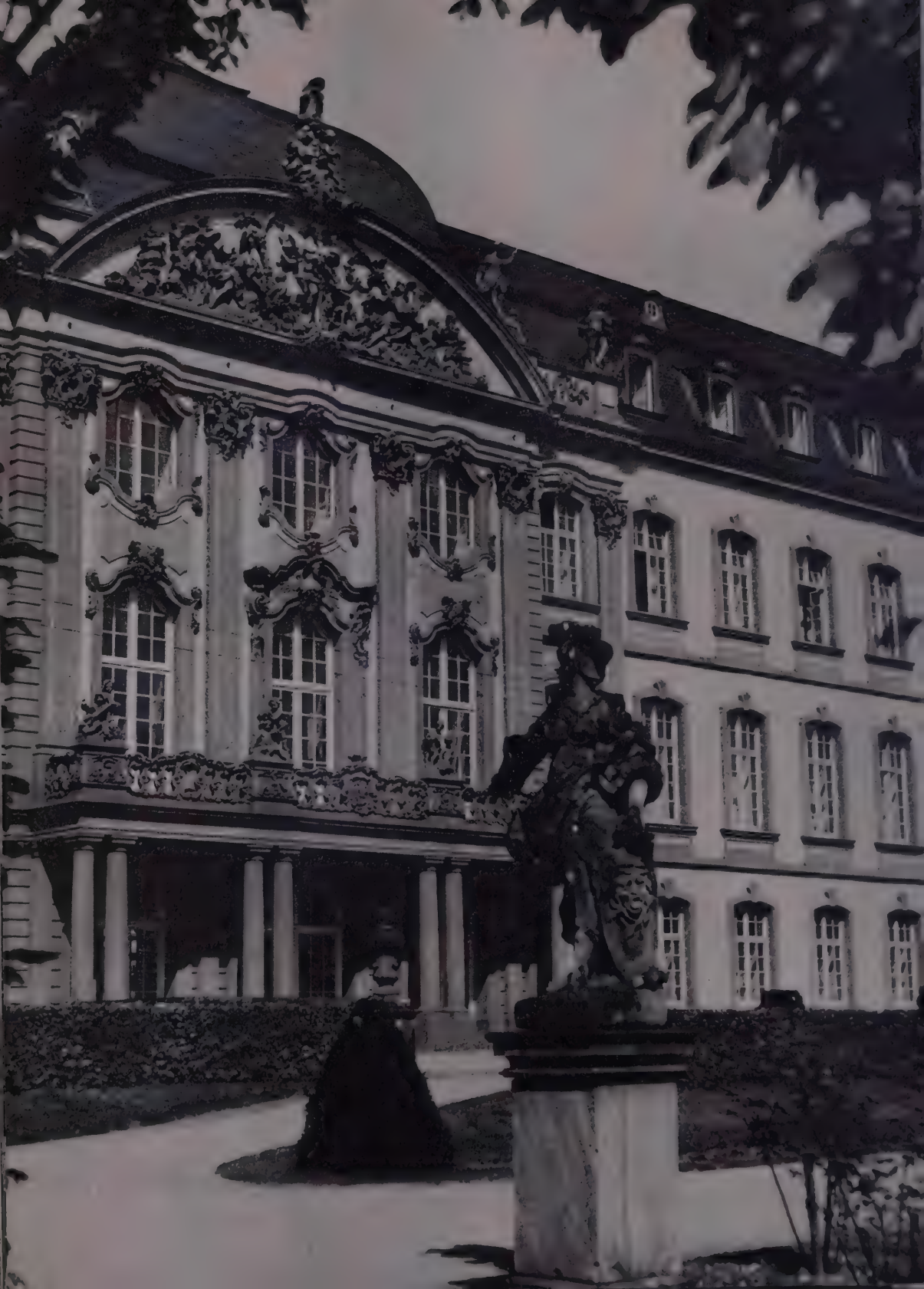


By courtesy of the Verkehrsamt, Trier

In the abbey of St Matthias the severe Romanesque nave, with its 15th-century vaulting, leads on to an excellent late Gothic choir

For in the 4th century the Roman Empire was divided for better administration into four sections, two under the joint Emperors, or 'Augusti', the other two under the 'Caesars' who assisted them. The western and north-western provinces, a vast area covering most of north-west Europe and including Britain, were ruled from Trier. The dominant figure was Constantine the Great. The high culture of Augusta Treverorum in which he and Ausonius lived was splendid and colourful, with the city a meeting-point for generals and high officials, for courtiers and their elegant ladies from the town mansions and from the lavish country houses of the neighbourhood. Its relics are best







*By courtesy of the German Tourist Information Bureau*

**Trier as the baroque capital of the Archbishop-Electors is best exemplified by two buildings: (opposite) the Palace, with its ornate façade in which pink sandstone is the main material, and (above) St Paulinus' Church, an extravaganza of gilded and painted stucco, iron and woodwork**

seen in the superbly rearranged Rheinisches Landesmuseum: most vivid of all are the mosaics and the carved marbles, the varied bronzes and the delicate Rhenish glassware, the pottery and the models of farms and villas. Yet the actual buildings of Roman Trier, though ruined and no longer throbbing with their original life, are more impressive, perhaps, than any other Roman architecture north of the Alps. They are on an imperial, not a provincial or local scale, reminding us that Augusta Treverorum became no ordinary city.

The finest Roman monument in Trier, and indeed in north-western Europe, is the splendid structure of the Porta Nigra; its name came from the slow blackening of its dark sandstone blocks. Through this huge gateway passed the highroad to Mainz and the frontier forts. It now seems, amid dense traffic and not far from the main railway station, to be the hub of the modern city, Trier's great symbol that among all towns in Germany it is 'somewhere different'. The Porta Nigra, unfinished and with the capitals of its

attached columns never carved, was built, like the granaries, to a standard design. Two archways were flanked, as in the main gate of Verulamium in Britain, by large semicircular towers. The surface was covered by a Colosseum-like decoration of attached columns and round-arched windows; on the inner side imposing arcades flanked the street. Though worn and battered, the Porta Nigra is amazingly intact. As with many relics of antiquity it was preserved because it was long used as a church; for, over nine centuries ago, a Greek hermit named Simeon, endowed like his famous namesake of the Pillar with a taste for strangely uncomfortable residences, came to Trier and was shut up in a dark cellar below one of the towers. Soon after his death he was canonized, and his friend Archbishop Poppo of Trier founded a monastery in his honour, the Simeonstift, next door to the gateway. The Porta Nigra's upper storeys, with the addition of a fine Romanesque apse, and with a tower and spire perched incongruously on one of the turrets, became the monks' church; it





*By courtesy of the Verkehrsamt, Trier*

**In 1818, Karl Marx was born in this unremarkable 18th-century house**

so remained, with some good rococo sculpture added, of which a fair amount survives inside, till Trier's conquest by revolutionary France. The two-storeyed monastic buildings of the Simeonstift have been much restored. They are now used as a combination of City Information Bureau, magnificently arranged local history museum, and an excellent café where in summer one can be refreshed at tables laid out beneath gay umbrellas round charming fountains.

The best preserved of Trier's other Roman buildings is the spacious basilica, spare and stark in the simplicity of its brickwork. The original coating of marble and mosaic perished

long ago, and the more recent fittings (for the basilica's use as Trier's Lutheran church) were burnt away in the heavy bombing of 1944. A 'basilica' was really a ceremonial hall for enthronements and other imperial functions, and despite the loss of its Roman paintings and marbles one can, in this vast interior now gauntly refurnished for worship, picture the crowds of courtiers and officials who must have filled it in Constantine's days. The same people would also have frequented the Kaiserthermen, or Emperor's Baths, not far away, a great suite whose ruins, like those of the Barbarathermen elsewhere in the town, are a mere wreck of their past but are enough to prove that such bathing establishments, in this northern capital city, were on a scale not far short of the *thermae* in Rome itself.

Above the Kaiserthermen, beyond the railway and actually built into the vine-clad slopes of the Petrisberg which rises just behind it, the amphitheatre could hold some 8000 spectators and had richly arcaded entrances; like other Roman buildings in Trier this amphitheatre, though still impressive, was much denuded of its fine masonry by mediaeval builders.

But one other great Roman building has in essence survived to be a leading feature of the modern town. This was one half of the double church, consisting of

two great parallel basilicas, which Constantine erected to hold the large crowds of 4th-century Christian worshippers. Later known as the 'bishop's church', it was the one which lasted to become the main structure of Trier's present cathedral; its ancient brickwork and the outlines of its original windows are best seen from outside. A typical German Romanesque western structure, with flanking turrets and a deep apse, was added by Archbishop Poppo. Many changes, moreover, have been made inside, and the present cathedral contains Gothic, Renaissance and rococo work, but one cannot forget that its main structure makes it one of the oldest

churches in Europe still used as it has always been. Its most treasured possession is the Holy Coat, which is said to be the seamless robe worn by Christ at his trial. It is rarely exposed to view, the last occasion being 1959, and in these special years Trier becomes internationally important as a place of pilgrimage.

A few yards from the cathedral, the site of the catechumens' church of Constantine's time is now covered by the lovely 13th-century basilica, the Liebfrauenkirche, with its pointed arches, high vaults and early traceried windows, of the French Gothic school. But its plan is rare in Western Europe in being a Greek cross, with arms of equal length; this has made it easy for a 'central' high altar to be installed as part of the church's restoration after war damage.

Mediaeval Trier, in some respects, is less convincing now than the city of the Romans. But the modern street plan is largely that of the Middle Ages, overlying the layout of Augusta Treverorum. The Market Place, gay and busy with its stalls and thronging buyers, is typical of a German mediaeval town; it is picturesquely overtopped by the late Gothic tower of St Gangolf's Church. Though the Steipe, the attractive old Town Hall, was wholly destroyed in 1944, there are some fine ancient houses both here and in the street leading in from the Porta Nigra. Some are

of the black-and-white half-timbering common in old German streets which have escaped rebuilding or war, while the stone-faced House of the Three Kings, of about 1200, is important for its windows whose arches are late Romanesque or Transitional Gothic. Of Trier's other mediaeval churches the most notable, in the southern outskirts, is that of the Benedictine abbey of St Matthias, containing as its chief treasure the relics of St Matthew himself, the only relics of an Apostle resting north of the Alps. Most of the church is severely Romanesque, and the splendid late Gothic choir, with its 'star' vault, is flanked by the pair of towers (with curious 17th-century additions) which are typical of the Romanesque design used for large churches in the westernmost districts of Germany.

The 17th and 18th centuries in Trier were the heyday of the Archbishop-Electors, who held temporal and spiritual sway over most of the Mosel valley from Trier down to Coblenz. It was Lothar von Metternich, of the family which later produced the famous statesman, who soon after 1600 rebuilt the Old Palace close to the basilica. Large elements of his work remain. More characteristic of the Germany of aristocratic, art-loving little courts is the long wing built about 1757 for the Archbishop Franz Georg von Schönborn. The architect of this

**Trier's railway station (built since the war) is one of the city's few modern public buildings**

*By courtesy of the German Tourist Information Bureau*





*By courtesy of the Verkehrsamt, Trier*



*(Left)* Looking over Trier from the north-west bank of the River Mosel, which lies hidden beyond the immediate foreground. Seen from a point further to the south, the town and its suburbs (*below*) are bounded by the river's steady curve, from which rise the low hills of the Eifel and Hunsrück. (*Opposite*) Fishing nets drying and Trier's mediaeval crane make a peaceful scene on the bank of the Mosel

*By courtesy of the German Tourist Information Bureau*





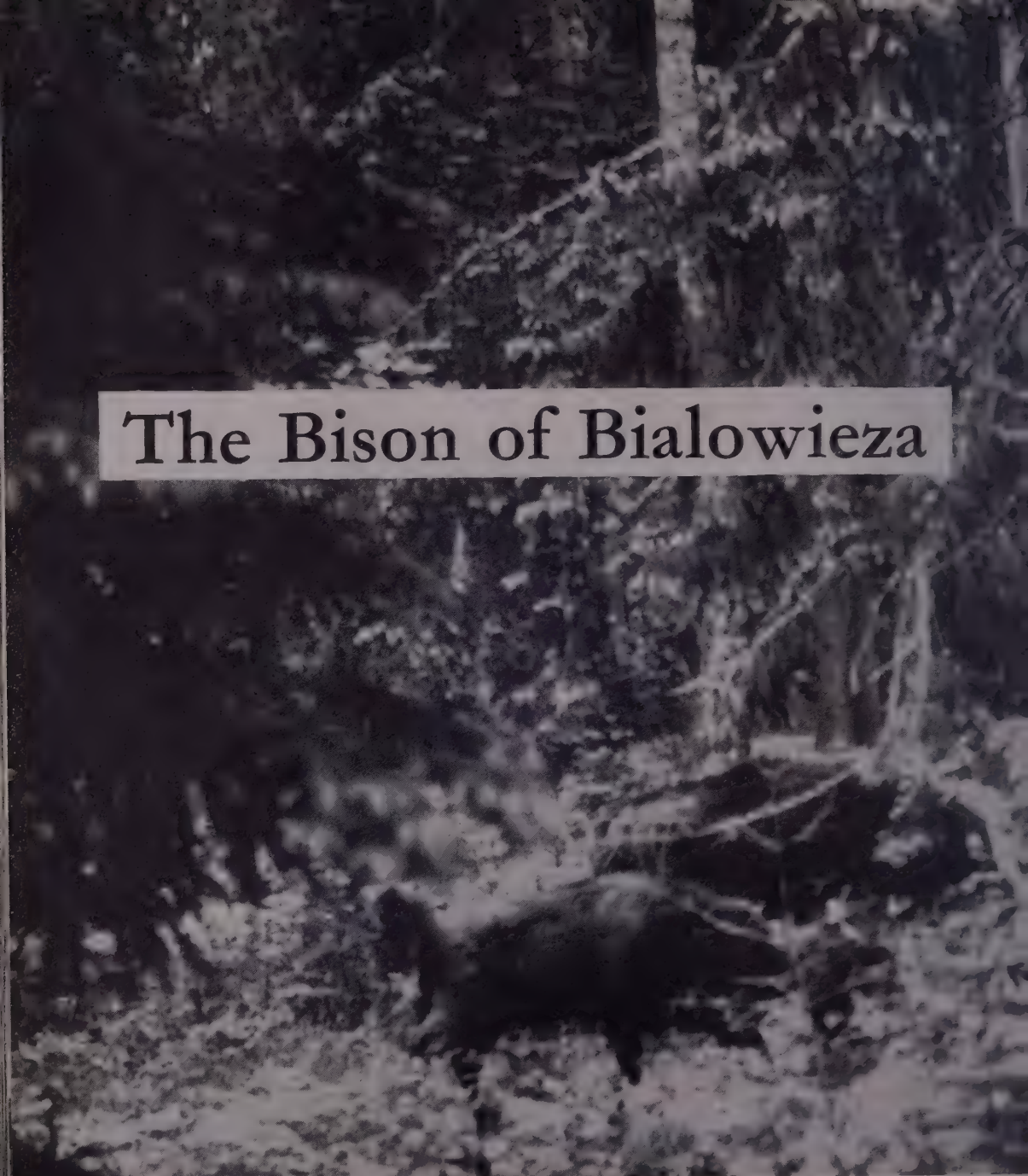
*By courtesy of the Verkehrsamt, Trier*

lovely building, overlooking its trim garden where the citizens now stroll among formal flower-beds and rococo statues, was Johann Seiz; the splendid sculpture of Ceres in its main pediment was by Ferdinand Diez. Not far from the cathedral, the gutted Kesselstadt Palace is likewise beautifully designed in the most ornate baroque taste. An even lovelier masterpiece, to my mind the most satisfying building in Trier, is the church of St Paulinus, a bishop of Trier in Roman times who was buried, as was St Peter at Rome, in a cemetery then outside the city. The Romanesque basilica built over his tomb was wrecked in the time of Louis XIV, and so in 1734 and the following years Archbishop von Schönborn replaced it by the beautiful church we can now admire. His architect, employed also by Schönborn's brother who was Prince-Archbishop of Würzburg in Franconia, was the famous master Balthasar Neumann. The rich interior, with its frescoes, stucco, delicate ironwork and an ornate pillared composition to surmount the high altar, was created by various artists and has been excellently restored, since 1945, to mint condition.

Some Trier houses are also of this period. None are more notable, historically speaking, than the

simple bourgeois house of 1727 where Karl Marx was born in 1818. The Archbishop-Electors had by now disappeared and Trier was well known as a gathering-place for men of liberal views like the Jewish lawyer who was Marx's father. The building, very suitably, is now the local office of the Social Democrat party. But it hardly seems, in the town which flourishes as a centre of the wine trade, as a tourist centre and as a recreation town for soldiers of N.A.T.O. armies, that Karl Marx is now a prophet much honoured in his native city. The vineyards, as we have seen at the Roman amphitheatre, grow close by the eastern outskirts of Trier. The town itself derives much profit, not only from the golden-yellow grapes growing on the neighbouring hills, but also from the merchanting and transport of wine made both in the Mosel valley and in the wine-growing districts watered by the Ruwer, a small river which runs into the Mosel just below Trier, and the Saar. This busy, workaday town is commercially prosperous as well as being an obvious, unforgettable tourist haunt. The shops crammed with the products of capitalist Western Germany's economic miracle, and the churches devoutly packed for every Sunday Mass would appear, emphatically, to give Karl Marx the lie.



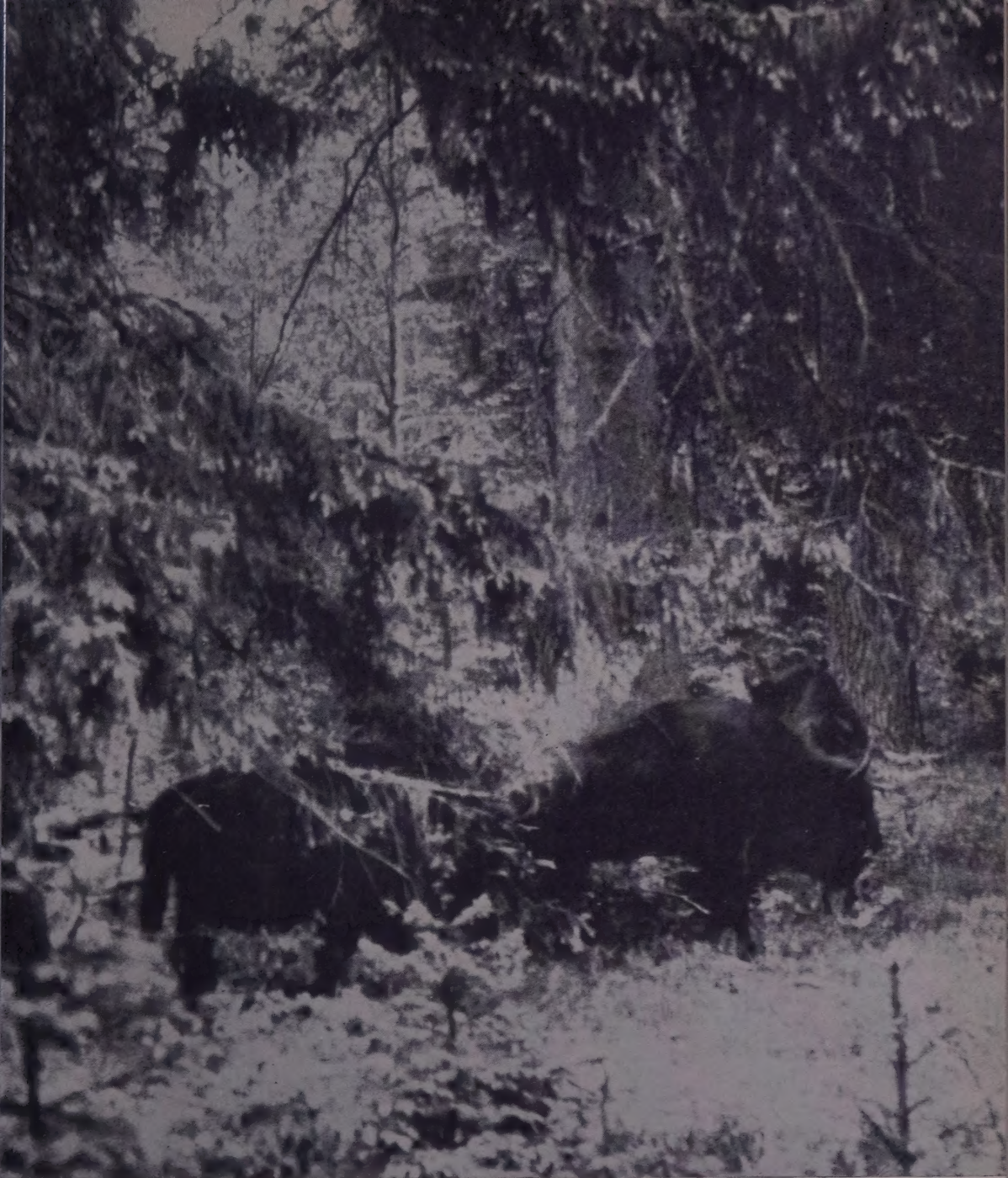
A black and white photograph of a European bison in a forest. The bison is seen from the side, partially obscured by dense foliage and trees. The lighting is dappled, with sunlight filtering through the leaves. The bison's head is turned slightly towards the viewer, showing its large, dark, shaggy fur and prominent horns. The background is a dense forest with many thin tree trunks and thick undergrowth.

# The Bison of Bialowieza

*The European bison, the largest land animal of Europe, is closely related to the American bison; unlike the latter, however, it lives in forest country, and eats not only grass, but leaves, bark and twigs. In summer the herds number about fifteen to twenty head, and in winter, two herds will join together; the old males often live and hunt alone.*

*The European bison used to inhabit more or less the whole of Europe; the oldest deposits in which bison fossils have been discovered are in England, in the Thames Valley and in Norfolk, and many fossils have also been found in France, Switzerland, Germany, Italy, as well as in Siberia and Alaska. The shrinking of the forests of Europe meant that*





All photographs by Giancarlo Scalzati, from Photo and Feature

the bison had progressively fewer places in which to live. In Julius Caesar's time they were abundant in the Black Forest. In the 9th and 10th centuries they were still sufficiently plentiful in parts of Switzerland and Germany to be a regular, if minor, source of food. But they were in retreat. They continued to disappear except in the great forests of Eastern

Europe, and by the end of the 15th century they were more or less confined to the forests of Bialowieza in eastern Poland, some forty miles south-east of Bialystok. Individual bison were occasionally found elsewhere but they were probably strays.

At that time Bialowieza lay within the boundaries



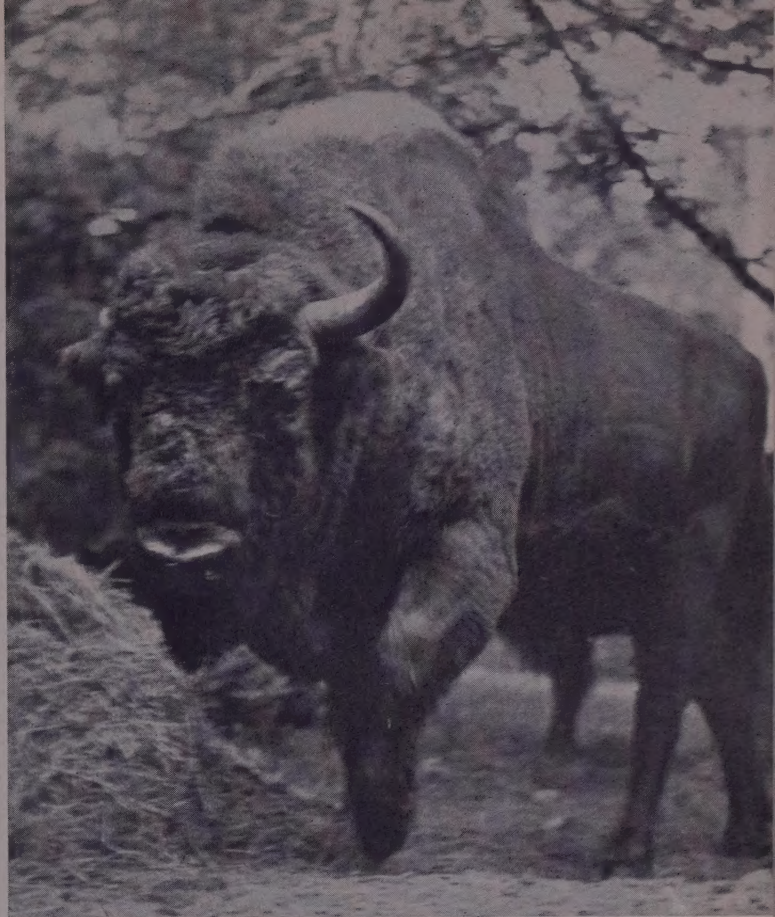


*of Lithuania, a Grand Duchy which stretched all the way from the Baltic to the Black Sea. In 1386 there had been a dynastic union with Poland, which was cemented by the Union of Lublin in 1569, by which*

*the two countries were linked in a single commonwealth, later to be called the Kingdom of Poland. Little is known of the bison at that time; but they were preserved and regarded as Royal Game,*



which implies that they were already fairly rare. At the Third Partition of Poland in 1795, Bialowieza, with its bison, became part of Russia. No proper count of the bison seems to have been attempted during this period; indeed, in 1822 it was not even known whether there were any left at all. In 1830 it was estimated that there were about 700. From then on records were kept, and the bison flourished; by 1860 there were 1700 in Bialowieza Forest. Then, in 1863, came a Polish insurrection against the Russians. Many of the rebels took to the woods, and the bison inevitably suffered. Their numbers decreased rapidly and in 1889 there were only 380 left. War and neglect continued to take toll of them until they were practically exterminated. In 1929, when the Forest was Polish once more, the authorities placed four specimens in a special enclosure in Bialowieza National Park, which had been laid out in 1921. It is from these four, and a few individual specimens introduced later, including some from







*the Duke of Bedford's English herd at Woburn Abbey, that the present herds have been built up. There are now about 200 bison in that part of Bialowieza Forest which Poland retained in the redrawing of the frontier with Russia after World War II.*

*Since the European bison is a dying race, preservation is not merely a matter of seeing that the animals have enough to eat. The most elaborate*

*precautions are necessary to guard them against infection. Visitors must wash themselves all over with insecticide, wear a special, all-enveloping overall, and special boots. The bison's enclosure is a heavy double wooden fence, and watch towers surround the area. Here, in company with elks and with tarpans, the cloven-hoofed 'wild' horses, the last of a species are protected by man from the extinction which man did so much to bring about.*